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PLANETARY PHENOMENA FOR MAY AND JUNE, 1895.

By Professor Malcolm McNeill.

May.

Mercury passes superior conjunction with the Sun on May 4th, and becomes an evening star. It moves rapidly away from the Sun, out toward east elongation, which it reaches on June 4th. By the middle of the month it sets about an hour after sunset, and at the end of the month about an hour and three-quarters after. It attains a greater distance from the Sun at this elongation than it did at the preceding east elongation in February, owing to the circumstance that at the February elongation the planet was only two days from perihelion, whereas in the June elongation it is twenty-six days from perihelion. The last few days in May and the first days of June are, perhaps, the most favorable time of the year for seeing the planet.

Venus is an evening star, rather farther away from the Sun than it was in April. At the end of the month it remains above the horizon more than three hours after sunset. It is moving rapidly eastward among the stars, through the constellations *Taurus* and *Gemini*, and at the end of the month it is a few degrees south of *Castor and Pollux* (*Alpha* and *Beta Geminorum*). On the morning of May 24, during daylight in the United States, it passes about 2° north of *Jupiter*, and at the end of the month it is only 3° west and north of *Mars*, which it passes on June 5.

Mars is still an evening star, but is drawing nearer the Sun, and at the end of the month it sets before 11 o'clock. It is moving eastward among the stars, about one-third more than the Moon's diameter per day, about half as fast as *Venus*, and toward the close of the month is a few degrees south of *Castor and Pollux* and east of *Venus*. Its distance from the Earth is still increasing, and it grows a little fainter.

Jupiter is still an evening star, but its distance from the Sun is decreasing, and at the end of the month it sets at about half past nine. During the month it moves about 6° eastward, in the constellation *Gemini*.

Saturn rises before sunset, and is well above the horizon by the time the stars become visible in the evening. At the end of the month it is on the meridian at about half-past nine. During the month it moves about 2° westward, in the constellation *Virgo*. The rings are a trifle less open than in April, the ratio being about 3 to 10.

Uranus follows about an hour after *Saturn*, and about 7° south. It is in opposition on May 8. It moves westward about 1° during the month, and at the end of the month it is about 3° east and 1° south of the third magnitude star *Alpha Libræ*. It is just within the limit of naked-eye visibility on a clear moonless night.

Neptune is in *Taurus*, quite near the Sun, and comes to conjunction early in June.

JUNE, 1895.

On June 21, at about 9 A.M., Pacific time, the Sun reaches the solstice, and summer begins.

Mercury is an evening star throughout the month, and reaches its greatest eastern elongation, 23° 45′, on June 4 and from June 1 to June 11, remains above the horizon from 1^h 54^m to 1^h 39^m after sunset. This is a longer time by about 20^m than at the February elongation, and the conditions for visibility are therefore better than they were in February. The planet can probably be easily seen after sunset, in the evening twilight, until the middle of the month. At the February elongation, *Mercury* was less than two days from perihelion; at the present elongation, it is about eighteen days from aphelion, which comes on June 22. This accounts for the greater distance from the Sun. The relative motions of *Mercury* and *Venus* are quite interesting. At the beginning of the month *Mercury* is about 5° west of *Jupiter;* both are moving eastward; but *Mercury* is moving much the faster, and on June 8, in the morning, it is in conjunction with *Jupiter*, passing about 47′ north of the latter. Its eastward motion soon slackens, and on June 18 it begins to move westward, and on the evening of June 21 is again in conjunction with *Jupiter*, this time 2° 34′ south; so that it will make almost a complete circuit around *Jupiter* during the month. After the middle of the month it approaches the Sun very rapidly, and comes to inferior conjunction on the morning of July 1.

Venus is an evening star nearly out to eastern elongation, which it reaches on July 11. Its distance from the Sun will increase until that time; but, as will be seen from the tables, the time during which it remains above the horizon after sunset steadily diminishes throughout the month, being only about two and a half hours at the end. This is owing to its rapid diminution in declination — over 9° during the month. In addition to this southward motion, it is moving rapidly eastward, and on June 5, it passes less than one degree north of *Mars*. It is very close to the Moon on the evening of June 25, and it will be occulted in some places.

Mars is still an evening star, but the Sun is gradually overtaking it in its apparent eastward path. At the end of the month it remains above the horizon only two hours after sunset. During the month it moves about 18° eastward and 4° southward among the stars, moving from a point 2° east and 5° south of *Pollux* (*β Geminorum*) through *Cancer*, nearly to the constellation *Leo*. It reaches aphelion early in July, but at the end of June it lacks about 20,000,000 miles of its greatest distance from the Earth; it will reach this in September.

Jupiter is also an evening star, setting rather more than an hour before *Mars;* by the end of the month it is less than half an hour behind the Sun, and is too near that body to be easily seen. It comes to conjunction on the morning of July 10.

Saturn is in good position for observation. It retrogrades (moves westward) a little less than 1° toward the first magnitude star *Spica* (α *Virginis*), and is about 10° east of that star. The ratio of major to minor axis of the rings is about 28%, and the minor axis is about three-fifths the polar diameter of the planet.

Uranus is also in good position for observation. It crosses the meridian about an hour after *Saturn*, but, as it is 7° farther south, it sets only about half an hour later. It is in the constellation *Libra*, and during the month it moves 53′ westward and 14′ northward. It is about as bright as a sixth-magnitude star, not far from the limit of naked-eye visibility on a clear moonless night, and it may be found at the beginning of the month about 3° east and 1° south of the third-magnitude star α *Libræ*. During the month it moves toward the star, about one-third of its initial distance. *Spica*, χ *Libræ*, and *β Scorpii* are nearly on a line, and *Saturn* is also near the same line, between the first two.

Neptune is in conjunction with the Sun on the morning of June 6, and becomes a morning star. It is too near the Sun to be seen, even with a good telescope.

Explanation of the Tables.

The phases of the Moon are given in Pacific Standard time. In the tables for Sun and planets, the second and third columns give the Right Ascension and Declination for Greenwich noon. The fifth column gives the local mean time for transit over the Greenwich meridian. To find the local mean time of transit for any other meridian, the time given in the table must be corrected by adding or subtracting the change per day, multiplied by the fraction whose numerator is the longitude from Greenwich in hours, and whose denominator is 24. This correction is seldom much more than 1^m. To find the standard time for the phenomenon, correct the local mean time by *adding* the difference between standard and local time if the place is west of the standard meridian, and *subtracting* if east. The same rules apply to the fourth and sixth columns, which give the local mean times of rising and setting for the meridian of Greenwich. They are roughly computed for Lat. 40°, with the noon Declination and time of meridian transit, and are intended as only a rough guide. They may be in error by a minute or two for the given latitude, and for latitudes differing much from 40° they may be several minutes out.

Phases of the Moon, P. S. T.

		H. M.
First Quarter,	May 1,	7 44 P. M.
Full Moon,	May 8,	3 59 P. M.
Last Quarter,	May 16,	9 44 A. M.
New Moon,	May 24,	4 46 A. M.
First Quarter,	May 31,	12 48 A. M.

The Sun.

1895.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
May 1.	2 34	+ 15 5	5 2 A.M.	11 57 A.M.	6 52 P.M.
11.	3 12	+ 17 53	4 50	11 56	7 2
21.	3 52	+ 20 12	4 41	11 56	7 11
31.	4 32	+ 21 56	4 35	11 57	7 19

Mercury.

May 1.	2 18	+ 13 7	4 53 A.M.	11 42 A.M.	6 31 P.M.
11.	3 43	+ 20 47	5 9	12 27 P.M.	7 45
21.	5 6	+ 25 3	5 36	1 11	8 46
31.	6 13	+ 25 26	6 1	1 38	9 5

Venus.

1895.	R. A.	Declination.	Rises.	Transits.	Sets.
	H. M.	° ′	H. M.	H. M.	H. M.
May 1.	5 0	+ 24 22	6 50 A.M.	2 23 P.M.	9 56 P.M.
11.	5 52	+ 25 25	6 58	2 35	10 12
21.	6 43	+ 25 16	7 11	2 47	10 23
31.	7 33	+ 24 5	7 27	2 58	10 29

Mars.

May 1.	6 25	+ 24 49	8 14 A.M.	3 48 P.M.	11 22 P.M.
11.	6 51	+ 24 23	8 2	3 35	11 8
21.	7 17	+ 23 41	7 52	3 22	10 52
31.	7 44	+ 22 43	7 43	3 9	10 45

Jupiter.

May 1.	6 14	+ 23 28	8 8 A.M.	3 37 P.M.	11 6 P.M.
11.	6 22	+ 23 26	7 37	3 6	10 35
21.	6 31	+ 23 21	7 7	2 35	10 3
31.	6 40	+ 23 15	6 37	2 5	9 33

Saturn.

May 1.	14 8	− 10 6	6 2 P.M.	11 30 P.M.	4 58 A.M.
11.	14 6	− 9 52	5 19	10 48	4 18
21.	14 3	− 9 39	4 36	10 6	3 36
31.	14 1	− 9 29	3 54	9 24	2 54

Uranus.

May 1.	15 3	− 16 56	7 26 P.M.	12 29 A.M.	5 32 A.M.
11.	15 2	− 16 49	6 40	11 44 P.M.	4 48
21.	15 0	− 16 42	5 59	11 3	4 7
31.	14 59	− 16 35	5 17	10 22	3 27

Neptune.

May 1.	4 52	+ 21 6	6 54 A.M.	2 15 P.M.	9 34 P.M.
11.	4 54	+ 21 9	6 17	1 37	8 57
21.	4 55	+ 21 12	5 39	12 59	8 19
31.	4 57	+ 21 14	5 2	12 22	7 42

ECLIPSES OF *JUPITER'S* SATELLITES, P. S. T.

		H. M.			H. M.
I R.	May 1,	4 58 P.M.	I R.	May 14,	6 15 P.M.
I R.	5,	9 51	II R.	15,	10 10
I R.	7,	4 20	I R.	21,	8 10
II R.	8,	7 34	III R.	30,	8 13

PHASES OF THE MOON, P. S. T.

		H. M.
Full Moon,	June 7,	3 0 A. M.
Last Quarter,	June 15,	3 28 A. M.
New Moon,	June 22,	1 51 P. M.
First Quarter,	June 29,	6 1 A. M.

THE SUN.

1895.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
June 1.	4 36	+ 22 4	4 35 A.M.	11 58 A.M.	7 21 P.M.
11.	5 18	+ 23 6	4 32	11 59	7 26
21.	5 59	+ 23 27	4 32	12 1 P.M.	7 30
July 1.	6 41	+ 23 8	4 36	12 4	7 32

MERCURY.

June 1.	6 18	+ 25 18	5 57 A.M.	1 39 P.M.	9 15 P.M.
11.	6 55	+ 23 10	6 9	1 37	9 5
21.	7 1	+ 20 26	5 47	1 3	8 19
July 1.	6 40	+ 18 39	4 52	12 2	7 12

VENUS.

June 1.	7 38	+ 23 55	7 28 A.M.	2 59 P.M.	10 30 P.M.
11.	8 25	+ 21 35	7 46	3 6	10 26
21.	9 9	+ 18 26	8 6	3 11	10 16
July 1.	9 49	+ 14 40	8 18	3 12	10 6

MARS.

June 1.	7 46	+ 22 36	7 42 A.M.	3 7 P.M.	10 32 P.M.
11.	8 12	+ 21 21	7 34	2 54	10 14
21.	8 38	+ 19 52	7 30	2 40	9 50
July 1.	9 3	+ 18 10	7 20	2 25	9 30

JUPITER.

1895.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
June 1.	6 41	+ 23 14	6 34 A.M.	2 2 P.M.	9 30 P.M.
11.	6 50	+ 23 5	6 5	1 32	8 59
21.	7 0	+ 22 53	5 35	1 2	8 29
July 1.	7 9	+ 22 39	5 7	12 32	7 57

SATURN.

June 1.	14 1	− 9 29	3 48 P.M.	9 20 P.M.	2 52 A.M.
11.	13 59	− 9 22	3 7	8 39	2 11
21.	13 58	− 9 18	2 27	7 59	1 31
July 1.	13 57	− 9 18	1 47	7 19	12 51

URANUS.

June 1.	14 58	− 16 35	5 13 P.M.	10 18 P.M.	3 23 A.M.
11.	14 57	− 16 29	4 32	9 37	2 42
21.	14 56	− 16 24	3 51	8 57	2 3
July 1.	14 55	− 16 20	3 10	8 16	1 22

NEPTUNE.

June 1.	4 57	+ 21 14	4 59 A.M.	0 18 P.M.	7 37 P.M.
11.	4 58	+ 21 17	4 17	11 36 A.M.	6 55
21.	5 0	+ 21 19	3 40	10 59	6 18
July 1.	5 2	+ 21 21	3 2	10 21	5 40

No eclipses of *Jupiter's* satellites are given this month, as *Jupiter* is too near the Sun for easy observation of such phenomena.